



The Correlation of Hand Muscle Load and Learning Outcomes towards Typing Activities of Balinese Script Using Keyboard of *Aksara Bali Smart*



IKG Suhartana ^a
N Adiputra ^b
K Tirtayasa ^c
IDP Sutjana ^d

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Abstract

The computer was to a tool that helps the human activities in various field unlike for education, banking, simulation, war, and so on. In regarding the education was used to learning e.g. typing a script. The computer was included three main components i.e. input components, a processing component, and an output component. The keyboard was included as an input component. Redesigning a keyboard was done to producing a special keyboard of *aksara Bali smart* that have the character feature was composed on it. In order to prove the efficiency and effectiveness the tool itself would be tested the connection of hand muscles load and learning outcomes of typing activity Balinese script using the keyboard of *aksara Bali smart*. The technique of correlating descriptive was used that involved 23 students, including 17 males and 6 females who met criteria the inclusion and exclusion randomly were selected. The analysis of correlation test showed that there was a connection to decreasing a muscle hand load with the improvement of learning outcomes an *aksara Bali* typing by *aksara Bali smart* tool to strong characters of $r_{xy} = -0,600$ and $p = 0,002$. The value of <0.05 indicated a strong and significant correlation between hand muscle load in learning outcomes negatively. The higher of muscle load decreasing, therefore, the lower was in learning outcomes and vice versa.

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Author correspondence:

IKG Suhartana,
Department of Computer Science, Faculty of MIPA,
University of Udayana, Denpasar, Bali, Indonesia
Email address: ikg.suhartana@gmail.com

^a Department of Computer Science, Faculty of MIPA, University of Udayana, Indonesia

^b Physiology Section, Faculty of Medicine, University of Udayana, Indonesia

^c Physiology Section, Faculty of Medicine, University of Udayana, Indonesia

^d Physiology Section, Faculty of Medicine, University of Udayana, Indonesia

1. Introduction

Unlike human tools, the computer is used in various field of human life e.g. in writing the script, drawing and others. It provides an ease, accelerated the humans work. The communication is proceeding by a computer can achieve the 1 kilobits per second, or it was called real-time system (Muhammed, 2013). It has three main components i.e. hardware, software, and users. Those components must be able to work properly well together to produce a good information.

The hardware includes an input device, processor, and output device. A device that categorized as an input device is a keyboard e.g. QWERTY, DEVORAC and others. The QWERTY keyboard is widely used as input devices have letters, numbers, punctuation, and alphabetic characters. However, in order to type an *aksara Bali* (Old Balinese letter of the alphabet), it does not work properly due to the composition of different characters on the keyboard with the characters in the Balinese script. The typing of scripts towards *aksara Bali* is important due to the script is often used to customs and religion for Balinese society. The *aksara* is as well used to write a script of Kawi languages or Old Javanese that influences Balinese language and also be used for writing Sasak language that some have been modified (Everson *et al.*, 2005). In the *aksara Bali* is to characters numeric or letters i.e. consonants or *wianjana* consisting of 33 characters, *aksara swara*, *aksara penggangge*, *pengangge tengenan*, *pasang pageh*, *aksara muduita*, numbers, punctuation and special letters with included a base letter about 18 letters (Tinggen, 1994). There are some base forms of *aksara Bali* shown on figure below:

ꦱ	ꦲ	ꦱ	ꦲ	ꦱ	ꦲ	ꦱ	ꦲ	ꦱ
ꦱ	ꦲ	ꦱ	ꦲ	ꦱ	ꦲ	ꦱ	ꦲ	ꦱ

Figure 1. The base characters of *aksara Bali*

The tools that do not use properly will occur workload, specifically hand muscle loads which will affect to learning outcomes. The workloads increasing is measured by increases in pulse rate in the human body activities due to the metabolism increases, therefore, O₂ is higher needs and pulse rate increases (Adiputra, 2002). In order to reduce the muscle loads, especially, the hands activities on *aksara Bali* typing is created a keyboard for typing named *aksara Bali smart* that arrangement character in accordance with the letters arrangement, numeric, and the signs towards *aksara Bali*. The effectiveness and efficiency of the keyboard use for *aksara bali smart* necessary has been examined to determine the hand muscles load relationship and in learning outcomes supposed, unlike a new keyboard. The hand muscles load measurement is to apply a questioner at 26 items with a Likert scale that the validities have been tested and its reliability as well learning outcomes are measured by using the formula (typing number - mistyping) / time.

2. Materials and Methods

The technique of correlating descriptive is used as a method that involves 23 randomly selected students who meet criteria for inclusion and exclusion. This technique focuses on the inter-variable naturally interpretations (Sugihono, 2011). The research aims at knowing the relationship between the hand muscles load as the independent variable and learning outcomes as the dependent variable in typing activities of *aksara Bali smart* using a keyboard. The data was obtained by measuring towards the hand muscles load using hand muscle of questioner that has been tested its validity and reliability. In learning outcomes, it is measured by calculations (typing number - mistyping) / time.

3. Results and Discussions

The statistical analysis is conducted after the collection of the data. The descriptive test results of subject characteristics i.e. on variables of age, height, weight, and body mass index are shown in table 1 below.

Table 1
The descriptive test results of research subject characteristics

No	Variable	Average	SB	Range
1	Age (years)	18,13	0,34	18-19
2	Height (cm)	161,74	6,95	150-173
3	Weight (kg)	65,17	8,77	49-81
4	Body mass index (kg/m ²)	24,87	2,66	20,81-32,87

Table 1 shows that the age variation of the research subjects range is 18 to 19 years old with an average of $18,13 \pm 0,34$. The age itself is productive, therefore, it can perform the activity optimally. [Manuaba \(2000\)](#) stated that the physical capacity is directly proportional to the age is up to age 25 years old. The research subject age is adolescence and productive. This is in accordance with the research that was conducted by [Tirtayasa \(2003\)](#) reported the students age of AKPER PPNI Denpasar in 2003 about between 19 to 20 years old. [Antari \(2004\)](#) reported students mean of the Department of Guidance and Counseling State Teacher Training Institute Singaraja is approximately 19 to 22 years old or the average of $20,69 \pm 0,79$. The height and research subjects vary about 150 cm to 173 cm or its average of $161,74 \pm 6,95$ cm. The average of height itself is categorized normally for Indonesian peoples. It is in accordance with [Ariati \(2008\)](#) reported that is low and height of students of Nutrition Polytechnic Denpasar from 157 cm to 166 cm its mean $160,88 \pm 3,27$ cm is in a normal condition. [Antari \(2004\)](#) stated that the students height average to its Department is in normal condition, namely an average of $163,25 \pm 6,52$ cm. The subjects weight is in the range of 49 kg to 81 kg it's mean of $65,17 \pm 8,77$ kg. The less weight has implication to the research subject results due to be adjusted of inclusion and exclusion criteria. The body mass index is in the range up to 32.87 or 20.81 its average is $24,87 \pm 2,66$. The mean body mass index is in the range 18 to 25 (Sandowski) and does not affect the speed of script typing.

The environment characteristics is a wet temperature, dry temperature, light intensity, humidity, wind speed and air pressure. The analysis results of the descriptive test environment characteristics are shown in table 2.

Table 2
The test result of descriptive environment characteristics

No	Variable	Average	SB	Range
1	Wet temperature (°C)	21,52	0,15	21,25-21,62
2	Dry temperature (°C)	25,09	0,14	24,94-25,27
3	Light Intensity (Lux)	457,27	6,68	452,76-468,00
4	Humidity (%)	72,94	1,17	71,80-74,30
5	Wind Speed (m/s)	0,11	0,01	0,10-0,13
6	Air Pressure (mb)	1013,29	7,63	1006,16-1026,18

Table 2 shows the wet temperature range of $21,25^{\circ}\text{C}$ up to $21,62^{\circ}\text{C}$ with its wet temperature average is $21,52 \pm 0,15^{\circ}\text{C}$. Dry temperature range is $24,94$ to $25,27^{\circ}\text{C}$ with its temperature is $25,09 \pm 0,14^{\circ}\text{C}$. The results of this study by the Ministerial Decree RI No. 1405/Menkes/SK/XI/2002 concerning the health requirements of the working environment and industrial office stated that the temperature in the workplace is in the range between 18°C to 28°C . The light intensity average is $457,27 \pm 6,68$ lux, the lowest light intensity is 452.76 lux and the highest light intensity is 468.00 lux. According to [Bommel \(2006\)](#) who observed an increasing of the light intensity was 300 lux become, 500 lux succeed to increasing productivity about 8%.

The results of this study are in accordance who those stated by [Suprpta \(2012\)](#) that the average light intensity classrooms in IKIP Saraswati Tabanan in the experimental group was $440,78 \pm 57,35$ lux. The average of humidity relative is $72,94 \pm 1,17\%$ with the lowest humidity relative is 71.80% and the highest humidity relative is 74.30%. The humidity itself is in accordance with [Manuaba \(1998\)](#) stated that the humidity relative ranged from 70% to 80% is categorized as a safe humidity. The wind speeds range research location is 0.10 m/s up to 0.13 m/s it's an average wind speed is $0,11 \pm 0,01$ m/s. This wind speed is safe due to less than 0.2 m/s in accordance with [Manuaba \(2006\)](#) stated that the average wind speed exceeds 0.2 m/s can cause dizziness, therefore, loss of warming body so that could be dehydration. The average of air pressure range towards the lowest pressure is 1006,16 mb up to 1026.18 mb

within its average is $1013,29 \pm 7,63$ mb. The average of air itself is in accordance with Yuliawan (2012) research results that found the average of air pressure was approximately normal i.e. range 1 atm or was equal to 1013 mb. The average hand muscles load and learning outcomes are illustrated in table 3 as follow.

Table 3
The test results of hand muscle load descriptive and learning outcomes

No	Variable	Average	SB	Range
1	Hand muscle load	52,16	1,87	48,60-56,20
2	Learning outcomes	98,70	2,18	94,40-104,05

Table 3 is a testing activities of typing *aksara bali* by the keyboard of *aksara Bali smart* indicates that the lowest muscle load range is 48.60 and the highest hand muscle loads hand is 56.20 within their range average of learning outcomes are $52,16 \pm 1,87$ whereas, the lowest learning outcomes is 94,40 and the highest is 104.05 with its average $98,70 \pm 2,18$. The correlation result of hand muscles load and learning outcomes towards on typing activities by the keyboard of *aksara bali smart* is shown in table 4.

Table 4
The data test correlation result of hand muscle load and learning outcomes

Variable	r	p
Hand muscle load	-0,600	0,002
Learning outcomes		

Table 4 illustrates that the Pearson correlation value is $r=-0,600$ and $p=0,002$. According to Sugihono with the correlation values itself showed a strong relationship with a value range of $r \geq 0,60$ and inverse and significant with $p < 0,05$.

4. Conclusion

The results of this study are to show that the data analysis results towards a testing of the hand muscles load correlation and learning outcomes on activities of typing *aksara bali* using a keyboard of the *aksara bali smart* is strong and overturned.

Conflict of interest statement and funding sources

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Statement of authorship

The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

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Biography of Authors

	<p>Ketut Gede Suhartana, S.Kom., M.Kom is a doctorate student in University of Udayana. His research interests is Physiology Section, Faculty of Medicine. He recently is doing a dissertation that is advised by the three professor who members in this article.</p> <p>Email: ikg.suhartana@gmail.com</p>
	<p>Prof. Dr. dr. I Nyoman Adiputra, M.OH is a professor that teaches in University of Udayana. He is qualified in Physiology Section, Faculty of Medicine, University of Udayana.</p>
	<p>Prof. dr. Ketut Tirtayasa, M.S., AIF is a professor that teaches in University of Udayana. He is qualified in Physiology Section, Faculty of Medicine, University of Udayana.</p>
	<p>Prof. dr. I Dewa Putu Sutjana, PFK, M.Erg. is a professor that teaches in University of Udayana. He is qualified in Physiology Section, Faculty of Medicine, University of Udayana.</p>